

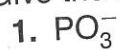
SELF-TEST**Multiple Choice:**

1. The total number of electron pairs around phosphorus for PCl_5 is
a. 2 b. 3 c. 4 d. 5 e. 6
2. An atom X is surrounded by 3 sigma bonds and 1 pi bond. The approximate bond angle around the central atom is
a. 90° b. 109° c. 120° d. 180°
3. An atom X is surrounded by an unshared pair of electrons, 2 sigma bonds, and one pi bond. The hybridization for the molecule with X as central atom is
a. sp b. sp^2 c. sp^3 d. dsp^3 e. d^2sp^3
4. Which of the following bonds would be the most polar?
a. C—C b. C—O c. C—F d. C—N
5. All of the following molecules have double bonds except
a. BeF_2 b. CO_2 c. SO_3 d. NO
6. Chlorine pentafluoride forms an expanded octet. Which of the following statements are true?
(1) There are 6 bonds to the central atom.
(2) There is a pair of unshared electrons around the central atom.
(3) Its geometry is that of a square pyramid.
(4) Its geometry is tetrahedral.
a. (1),(3) b. (2),(4) c. (1),(4) d. (2),(3)
7. Which of the following form expanded octets?
(1) NF_3 (2) CO_3^{2-} (3) XeF_4 (4) ClF_3
a. (1),(2) b. (3),(4) c. (1),(4) d. (2),(3)
8. For which of the following species can one write reasonable resonance structures?
(1) ClO_2^- (2) CO_3^{2-} (3) SO_2 (4) NO_2^- (5) ClO_4^-
a. (1),(2),(3) b. (2),(3),(4) c. (3),(4),(5) d. (2),(3) e. (3),(5)
9. Which of the following lists the molecular geometries of ClF_5 , SO_3 , and PF_5 correctly and in order?
a. square pyramid, trigonal planar, trigonal bipyramid
b. octahedral, bent, trigonal bipyramid
c. octahedral, trigonal planar, triangular bipyramid
d. trigonal bipyramid, linear, tetrahedral

10. Which of the following molecules is/are nonpolar?
- a. $(\text{XeF}_5)^+$ b. CH_2F_2 c. SO_2 d. OF_2
- e. a, b, c, d are polar f. a, b, c, d are nonpolar

Problems:

Give the Lewis structures and all resonance forms, if any, of the following:



Consider the following molecules. Determine

- a. their Lewis structures
- b. their geometry
- c. their bond angles
- d. their polarity
- e. the hybridization of the central atom
- f. the number of sigma and pi bonds

If the molecule is an expanded octet, determine only its Lewis structure, geometry, and hybridization.

4. OCS

5. NO_3^-

6. $\text{H}_3\text{C}-\text{O}-\text{CCl}_3$

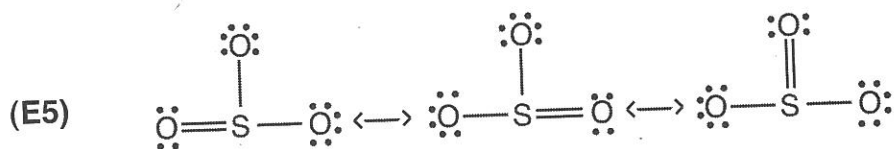
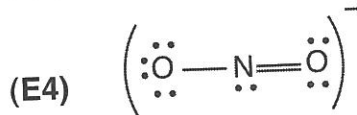
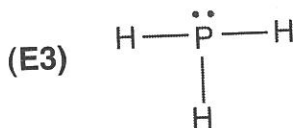
7. $(\text{SbF}_5)^{2-}$

8. PCl_3F_2

ANSWERS

Exercises:

(E1) 3

(E2) $\text{Cl}-\text{N}-\text{O}$ (E6) $\text{N} \equiv \text{N} - \text{O}$ (E8) linear, 180° (E10) tetrahedral, 109°

(E12) octahedral

(E14) nonpolar

(E16) sp , 2σ , 2π (E18) sp^3 , 4σ (E20) sp^3d^2 , 6σ (E9) trigonal planar, 120°

(E11) trigonal bipyramid

(E13) polar

(E15) nonpolar

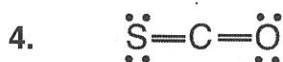
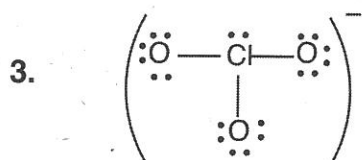
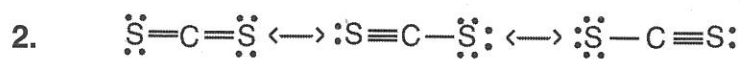
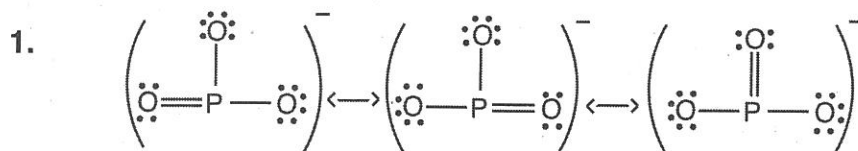
(E17) sp^2 , 3σ , 1π (E19) sp^3d , 5σ

Self-Test

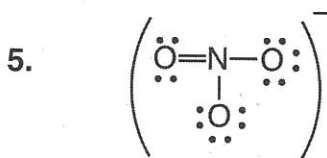
Multiple Choice:

1. d 2. c 3. b 4. c 5. a 6. d 7. b 8. b 9. a 10. e

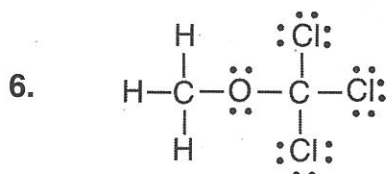
Problems:



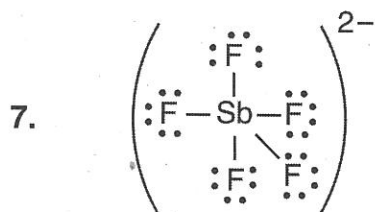
linear; 180° ; polar; sp; 2σ ; 2π



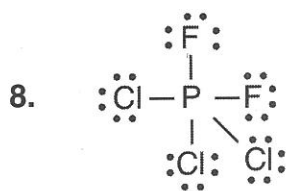
trigonal planar; 120° ; nonpolar; sp^2 ; 3σ ; 1π



bent; 109° ; polar; sp^3 ; 8σ



square pyramid; sp^3d^2



trigonal bipyramid; sp^3d